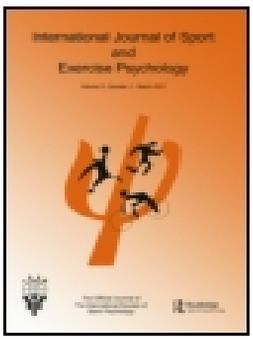

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Hardiness differentiates military trainees on behavioural persistence and physical performance

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Hardiness is a personality trait that drafts courage and motivation during adversity. Research showed that hardiness differentiates elite athletes from their lower rank competitors. In the domain of sport psychology, hardiness also strongly predicts physical performance. Because the military occupation requires resilience and excellence in physical performance, researchers investigated hardiness and behavioural persistence during training. However, in those studies, hardiness' impact was weak. Besides, military researchers seldom addressed hardiness' effect on physical performance. We investigated the influence of hardiness on behavioural persistence and physical performance during the military basic training. Participants were 233 trainees involved in a 22-week long basic training. They completed hardiness measures at the beginning of the training and then, two months later, we registered who stayed involved and who had dropped out. The remaining trainees participated in a self-defence exercise and their trainers evaluated their performance. Our analysis indicated that hardiness significantly predicted behavioural persistence: the trainees still involved in the training after two months scored significantly higher on the hardiness scale than those who dropped out ($\mathrm{EXP}(B) = 1.08$; $p < .05$). Our results however confirm that hardiness has a weak direct effect on persistence of military trainees. During the self-defence exercise, hardiness positively predicted physical performance ($\chi^2_{2\mathrm{df}} = 9.87$; $p < .05$). We discuss the possible relation of hardiness with other major persistence predictors in the military, such as health, health practices, and social support. Our study is the first to indicate a strong relationship between hardiness and soldiers' physical performance.

Keywords: hardiness; persistence; physical performance; military

Introduction

Hardiness (Kobasa, 1979) functions as a resistance resource under adversity. This personality trait is "a composite of the interrelated attitudes of commitment, control, and challenge that together provide the existential courage and motivation to turn stressful circumstances from potential disasters into growth opportunities" (Maddi, Khoshaba, Harvey, Fazel, & Resurreccion, 2010, p. 369). Hardy individuals are committed to whatever activities they undertake (commitment), think they have a definite influence on their own life (control), and consider stressful situations as opportunities to learn and grow (challenge). This positive approach of life provides the hardy individual the courage to face and overcome adverse situations.

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Initially, hardiness research mainly focused on its health protective effects (e.g. Funk, 1992; Kobasa, Maddi, & Kahn, 1982; Wiebe & McCallum, 1986). But because hardy individuals appraise stressful events as less threatening (e.g. Florian, Mikulincer, & Taubman, 1995; Maddi, 1999; Nicholas, 1993), are more confident in their ability to deal with them (Delahaij, Gaillard, & van Dam, 2010; DiBartolo & Soeken, 2003; Williams & Lawler, 2003), and are more prone to take a head-on approach to facing adversity (e.g. Delahaij et al., 2010; Eid, Johnsen, Saus, & Risberg, 2004; Soderström, Dolbier, Lieferman, & Steinhard, 2000), they are also likely to outperform their less hardy counterparts. Therefore, at the turn of the millennium, a growing number of researchers pointed their interest on hardiness' potential to foster human performance. For example, many studies indicate that students high on hardiness meet greater academic achievement (e.g. Lifton, Seay, & Buschko, 2000; Maddi, Harvey, Khoshaba, Fazel, & Resurreccion, 2009; Sheard, 2009). Research also shows that hardy employees are more efficient in the work place (e.g. Cash & Gardner, 2011; Maddi et al., 2006; Maddi, Harvey, Resurreccion, Giatras, & Ranagold, 2007).

Several authors investigated the role of hardiness in athletic performance. The first study in this field (Maddi & Hess, 1992) showed a positive association between hardiness and several indices of performance among US varsity basketball players. British researchers (e.g. Golby & Sheard, 2004; Sheard & Golby, 2010; Thomas, Reeves, Agombar, & Greenlees, 2013) found that elite athletes of various disciplines (e.g. rugby, martial arts/boxing, motorcycling) scored significantly higher in hardiness than their lower ranked competitors. Among Iranian soccer players, Rezae, Ghaffari, and Zolfalifam (2009) also found that hardiness distinguished elite from non-elite individuals and that hardiness was associated with athletic performance in both groups. However, the sport and exercise psychology literature lacks of attempts to relate hardiness and behavioural persistence, that is, enduring efforts to stay involved in an activity despite its inherent difficulties. That is surprising as many researchers in that field focused their interest on that variable (e.g. Joessaar, Hein, & Hagger, 2011; Le Bars, Gernigon, & Ninot, 2009; Pelletier, Fortier, Vallerand, & Brière, 2001).

The relationships between hardiness, performance and behavioural persistence raised considerable interest in the military context too. Like athletic activities, the military profession demands qualities of resilience and excellence in cognitive and physical performance. Therefore, hardiness also yielded a large body of research in the military context. Although many studies still fit in the mainstream of hardiness-health research (e.g. Eisen et al., 2014; Orme & Kehoe, 2014; Taylor, Pietrobon, Taverniers, Leon, & Fern, 2013), researchers also investigated hardiness' potential to enhance military performance. One particular field of focus in that frame is the basic training, because it includes heavy physical challenges (e.g. self-defence exercises, running and swimming tests, long-range walks with a loaded rucksack) and psychological stressors (e.g. hostile new environment, evaluative threats, separation from the family). Those demands may lead to impaired performance (Maddi, 2007) and in many cases, in early dropout among new trainees (e.g. in the Netherlands about 20% of the Dutch military candidates give up in the early phases of the basic training; Cremers, Van der Linden, te Nijenhuis, & Van de Ven, 2011).

Most of the literature on hardiness and performance during the military basic training investigated hardiness' impact on cognitive performance. For example, Bartone, Eid, Johnsen, Laberg, and Snook (2009) and Bartone, Kelly, and Matthews (2013) used supervisors' ratings of military and leadership performance among cadets; Maddi, Matthews, Kelly, Villareal, and White (2012) used a score of academic performance. Few authors examined how hardiness influenced physical performance in the military context. Those who did found limited results. For example, Westman (1990) reported a weak relationship between hardiness and physical performance of Israeli cadets on an obstacle track. Eid and Morgan (2006) found no significant relationship between hardiness

and non-verbal performance of Norwegian cadets during a highly stressful prisoner of war exercise. These results are surprising as hardiness seems to be a moderate to strong predictor of physical performance among athletes (Maddi & Hess, 1992; Rezae et al., 2009).

Besides, several studies in the military context related hardiness to behavioural persistence in training. Hardiness predicted behavioural persistence in the United States Special Forces selection procedure (Bartone, Roland, Picano, & Williams, 2008), the full completion of a nine-day Artic ski-march among Norwegian border patrol troopers (Johnsen et al., 2013), and persistence among cadets after the first academic year (Maddi et al., 2012). However, the effect sizes of these studies were small. Based on Chinn's (2000) formula, they ranged between $r = .02$ (Bartone et al., 2008) and .04 (Johnsen et al., 2013; Maddi et al., 2012), and this although the researchers included no control variables or at least no significant ones. Lee, McCreary, and Villeneuve (2010) investigated many potential predictors of persistence in the Canadian military basic training simultaneously (including 15 personality traits such as neuroticism, mastery and agreeableness). When introduced in a multiple regression analysis, hardiness failed to be a significant antecedent of persistence among trainees.

In sum, research in sport and exercise psychology indicates that hardiness differentiates elite athletes from their lower ranked counterparts. Hardiness also tends to moderately to strongly associate with performance of sportsmen and women. Military researchers tried to replicate these results, but surprisingly, their results indicated weak relationships or only concerned cognitive aspects of performance. Actually, not much is known about the relationship between hardiness and physical performance of military members. Accordingly, the present study aims at assessing hardiness' impact on behavioural persistence and physical performance among soldier trainees during their basic training. We hypothesise that hardy trainees are more likely to persist at least two months to complete their basic training. To measure physical performance, we chose to use a self-defence exercise against several opponents. This type of exercise is very stressful, technically difficult, and represents the highest category of physical adaptation to teach and assess hand-to-hand fighting techniques (Harasymowicz & Kalina, 2005). We hypothesised that hardiness is positively related to physical performance during that self-defence exercise.

Method

Participants

The sample consisted of 233 male trainees who enrolled in a 22-week basic training to become soldiers in the Dutch Army. No woman signed in for this training at the time of our study. Their age ranged from 17 to 29 years ($M = 19.09$; $SD = 2.23$). The vast majority among them had a secondary school degree (95.30%), while the others had a primary school degree (1.70%), a bachelor degree (0.90%) or another type of education (2.10%).

Measures

Hardiness

We used the Dispositional Resilience Scale II-Military (DRS II-M; Sinclair, Oliver, Ippolito, & Ascalon, 2003) to measure hardiness because this scale was previously validated for a Dutch military sample (Delahaij et al., 2010). It results of several refinements of the initial DRS (Bartone, Ursano, Wright, & Ingraham, 1989). The DRSII-M presents a good internal consistency and good criterion-related validity, including in military samples (Delahaij et al., 2010; Sinclair & Oliver, 2003; Sinclair et al., 2003). Examples of positive and negative items measuring

commitment are: "I enjoy most things in life" and "Sometimes, life seems meaningless to me". Examples of control items are: "My successes are because of my effort and ability" and "No matter how hard I try, my efforts usually accomplish nothing". Examples of challenge items are: "I take a head-on approach to facing problems in my life" and "It bothers me when my daily routine gets interrupted". The participants rated the items on a 5-points Likert scale, ranging from *Not at all true* (0) to *Completely true* (4).

In our sample, after removing five items (all the negative challenge items and the control item: "I feel confident I can handle just about any challenge") with a low item-total correlation (reducing thereby the reliability), the Cronbach's alpha of 0.81 was good according to the criteria reported by Field (2005). Hystad, Eid, Johnsen, Laberg, and Bartone (2010), among others, advise to investigate the three facets of hardiness (commitment, control and challenge). But in our sample, the reliability of these subscales was too low (respective Cronbach's alpha of 0.67, 0.63 and 0.55) to be acceptable. Therefore, we adopted a total score approach rather than an individual score or a regression approach. This approach was consistent with the current common practice in hardiness research (e.g. Alfred, Hammer, & Good, 2014; Bansal, 2014; Perkins, Randall, Toozs-Hobson, Sitch, & Ismail, 2014). In order to compare our results to those of previous studies, we computed two hardiness scores. After reversing the negatively keyed items, we multiplied the average item scores by 45 (Bartone et al., 2008; Johnsen et al., 2013) and by 54 (Maddi et al., 2012).

Performance

As an indicator of behavioural persistence, we registered after two months to identify which trainees were still involved in the training (group PERSISTENT) and who had dropped out (group DROPOUT). In the PERSISTENT group, we assessed physical performance during a self-defence exercise. Experienced military trainers evaluated the participants' ability to hit boxing pads and no other targets when trying to defend themselves. The trainers rated that exercise on a 5-points Likert scale, ranging from *insufficient* (1) to *very good* (5). This exercise and the associated evaluation is a routine procedure during the basic training and the self-defence exercise. The trainers were used to accurately and uniformly assess trainees' physical performance.

Procedure

At the start of the training (T1), we informed the participants about the general goals of the study. We told them that we were interested in the profile of military trainees and in their results during the training. The questionnaire they had to fill in was part of a more general study and included items from other scales than the DRS II-M. Participation was voluntary and had no influence on the outcomes of their training. By completing and returning the questionnaires, the participants implicitly consented to be included in the study, but they could withdraw their participation at any moment. At T1, 94% of the participants ($n = 220$) fully completed the DRS II-M. During the basic training, participants learnt self-defence techniques among other typical basic military skills (e.g. map reading, firing a rifle, camouflage). The self-defence training implied the use of boxing pads to protect the trainers and the sparring partners. Participants learnt to hit these targets and no other one when involved in an exercise. During the first two months, 57 trainees decided to withdraw their participation from the study. The remaining subsample to measure persistence after two months of training (T2) was thus of 176 participants: 50% in the PERSISTENT group and 50% in the DROPOUT group. This also means that 88 trainees performed the self-defence exercise. The exercise included several scenarios in which opponents would use more or less violence; recruits had to respond in a proportional way in each scenario. This type of

exercise represents the highest category of physical adaptation in hand-to-hand fighting exercises (Harasymowicz & Kalina, 2005).

Statistical procedure

For all our analyses, we used IBM SPSS 22. This program requires a complete dataset to compute the average item hardiness' score for each participant. Therefore, we replaced by linear interpolation 0.83% values missing on the 4224 response matrix (24 items × 176 participants).

In our sample, hardiness was normally distributed ($\chi^2 = 0.04$; $p = .20$). The variances of the PERSISTENT and the DROPOUT groups were homogeneous ($F = 1.49$; $p = .22$ with 174 df). We first performed a logistic regression to test if belonging to the PERSISTENT and the DROPOUT groups, respectively, was random or could be explained by hardiness. We used age as a control variable, as previous research identified it as an important predictor of persistence (Trone, Reis, Macera, & Rauh, 2007). To compute effect size, we used Chinn's (2000) formula. Finally, we used an independent sample *t*-test to compare the hardiness mean scores of the two groups.

In the PERSISTENT group, physical performance was not normally distributed ($\chi^2 = 94.33$; $p < .001$). Therefore, we treated it as an ordinal variable and used the independent Kruskal–Wallis method to test if the category of performance obtained during the self-defence exercise (*insufficient*, *average*, *sufficient*, *good*, *very good*) reflected different levels of hardiness. Finally, we computed the effect sizes according to the method proposed by Field (2005).

Results

Controlled for age (which was not significant in the regression model with EXP(*B*) = 1.00; $p > .05$), hardiness significantly predicted whether participants belonged to the PERSISTENT or the DROPOUT groups (chi-square model = 4.38; $p < .05$ with 2 df). The Wald criterion for hardiness of 4.11 ($p < .05$) also indicates that hardiness made a significant contribution to the persistence outcome. The EXP(*B*) value reported in Table 1 indicates that when hardiness rises by one unit on 45, trainees are 8% times more likely to persevere at least two months during the basic training. Reported on a 54 scale, trainees are 7% times more likely to still be involved when hardiness rises by one unit. The effect size associated with these odds ratio is small ($r = .04$). The independent samples *t*-test confirmed that the PERSISTENT and DROPOUT hardiness means were significantly different ($t = 2.23$; $p < .05$). In other words, the trainees of the

Table 1. Hardiness means (on a 45 scale score), standard deviations, range, and results of the logistic regression (controlled for age) among trainees still involved in the basic training after two months (PERSISTENT) and those who dropped out earlier (DROPOUT).

	N	Mean	SD	Min.	Max.	EXP(*B*)	CI[a]	SE[b]
PERSISTENT	88	32.28	4.28	24.11	45.00			
DROPOUT	88	30.87	4.13	17.28	45.00			
Total sample	176	31.57	4.25	17.28	45.00	1.08[c]*	1.00–1.16	.04

[a]95% confidence interval.
[b]Standard estimate.
[c]Chi-square model = 4.38; $p < .05$ with 2 df.
*$p < .05$.

PERSISTENT group scored significantly higher on hardiness – measured at T1 – than their counterparts of group DROPOUT. Figure 1 shows this difference.

In the PERSISTENT group, we tested if the category of rating attributed to the participants during the self-defence exercise, taking place at T2, differed according to their level of hardiness, measured at T1. The χ^2-value of 9.87 with 4 df is significant at $p < .05$. It indicates that the level of performance of the participants differs according to their level of hardiness. *Post hoc* pairwise comparisons show significant differences (at $p < .05$) between the category *very good* and *sufficient*, and *very good* and *insufficient*. Participants getting a *very good* rating, scored significantly higher on hardiness than those getting a *sufficient* or *insufficient*. The effect size is large ($r = .79$) between *very good* and *insufficient*, and medium ($r = 0.42$) between *very good* and *sufficient*. Figure 2 reports these results.

Discussion

We found that hardiness predicted physical performance among military trainees. We measured hardiness at the beginning of their training and when exposed to a stressful self-defence exercise two months later, the highest achievers among them were also the highest in hardiness. These results are comparable to those of previous studies comparing elite athletes to their lower ranked competitors (e.g. Golby & Sheard, 2004; Sheard & Golby, 2010; Thomas et al., 2013). Also, the effect sizes of our study, which is large between the highest and lowest performers, are comparable to those obtained in past research among elite and non-elite athletes (Rezae et al., 2009). They are also larger than those of previous studies in the military training context (Eid & Morgan, 2006; Westman, 1990). This is the first time that a strong relationship between hardiness and physical performance is evidenced in that context.

Because of the heavy physical and psychological challenges of the basic training, a new military trainee can experience it as a threat to his well-being. This can lead to lowered performance. Positive primary appraisal, confidant secondary appraisal and active coping associated with hardiness may buffer that distress. Previous findings show that hardiness positively relates to primary (e.g. Florian et al., 1995; Maddi, 1999; Nicholas, 1993) and secondary appraisal (e.g. Delahaij et al., 2010; DiBartolo & Soeken, 2003; Williams & Lawler, 2003), and to adaptive coping strategies (Delahaij et al., 2010; Eid et al., 2004; Soderström et al., 2000). Hence, the hardy individual appraises the basic training as less stressful, is confident in his ability to succeed, and actively copes with the basic training demands in order to become a fully confirmed service member. Therefore, hardy trainees are likely to outperform their less hardy counterparts in cognitive tasks (Bartone et al., 2009, 2013; Maddi et al., 2012) and in physical ones, as our results suggest.

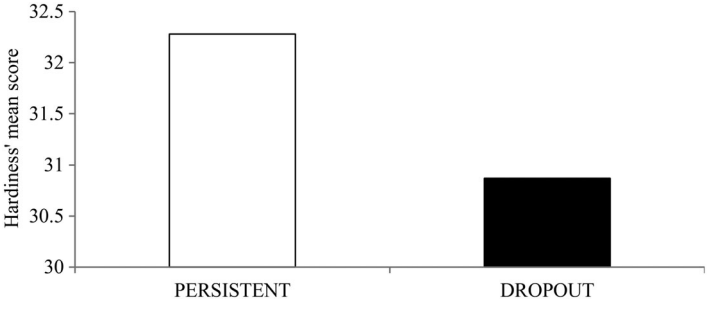

Figure 1. Comparison of hardiness' mean score between trainees still involved after two months of military basic training (PERSISTENT) and those who dropped out earlier (DROPOUT).

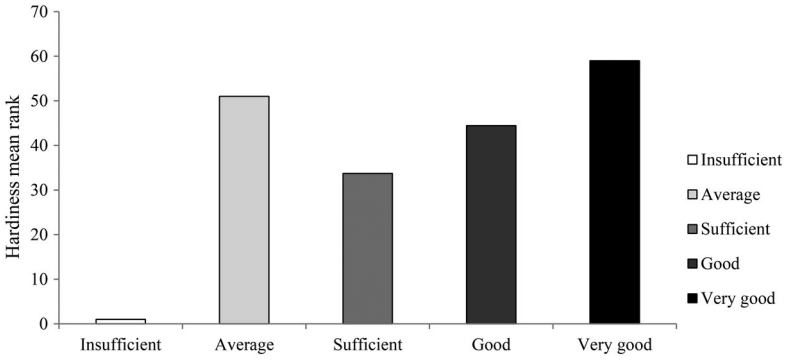

Figure 2. Comparison of hardiness mean rank across ratings obtained during the self-defence exercise.

In our study, hardiness significantly predicted behavioural persistence during the military basic training. We measured hardiness at the beginning of the training and found that the hardiest trainees were more likely to still be involved two months later. For each gain in one unit on a 45 hardiness scale, trainees are 8% times more likely to persevere at least two months. Our results are exactly in the same range as those obtained among Special Forces operator candidates (Bartone et al., 2008), border patrol troopers (Johnsen et al., 2013) and cadets (Maddi et al., 2012). Thus, the results of those previous studies are generalisable to the soldier trainee population. However, as in those previous studies the effect of hardiness is rather small. We controlled only for age (which was actually not a significant predictor in our study), and we doubt the effect would endure the introduction of other important predictors of persistence (as in Lee et al., 2010).

In the absence of a direct effect, we can hypothesise for future research an indirect effect of hardiness through other major persistence predictors that are themselves influenced by hardiness. For example, research consistently indicates that hardiness is a strong predictor of health (e.g. Eisen et al., 2014; Orme & Kehoe, 2014; Taylor et al., 2013) and health is a strong predictor of persistence (e.g. Canada et al., 2007; Kaufman, Brodine, & Shaffer, 2000; Lee et al., 2010). Thus, it is possible that the effect of hardiness is partially mediated by the health status of the trainees. In other words, the less hardy trainee would begin with a "health handicap" and would consequently be more likely to be injured because of the heavy physical exercises or to become ill because of the prolonged exhaustion induced by the basic training. In turn, injuries and illnesses would lead to performance breakdowns and/or premature dropout. Alternative indirect effects of hardiness on persistence may include other persistence predictors such as substance abuse (Canada et al., 2007) or social support (Lee et al., 2010), both having been related to hardiness in previous studies (e.g. respectively, Wiebe & McCallum, 1986; Ganellen & Blaney, 1984). To get a more complete picture of hardiness as a predictor of behavioural persistence during training, future research should address the relationships between hardiness and those other major antecedents.

Three aspects may limit our findings: the high dropout rate in our sample, the rather high hardiness level of trainees with an average self-defence performance, and a sole total score approach of hardiness. First, the dropout rate of 50% is quite high. The dropout rate is on average 20% in the Netherlands (Cremers et al., 2011), but this figure can vary across classes. One possible explanation is that the participants of this study enrolled in the Army to become paratroopers. The basic training of these elite soldiers is generally tougher than the basic training of "common" infantry soldiers. This could limit the generalisability of our findings to elite troops

and exceptionally demanding basic training situations, but the results in Maddi et al. (2012) seem to indicate that hardiness is also important in non-elite troops.

Second, our longitudinal design limited the sample size, as we could only work with those trainees staying involved long enough to participate in the self-defence exercise. This affected the distribution of performance ratings in our sample, as the non-normal distribution suggests. However, as non-parametric tests are less sensitive than their parametric equivalents (Whitley & Ball, 2002), we can suspect that the effect of hardiness on performance would have been even larger if the assumptions of normality and homoscedasticity had been met.

Third, we used a total score approach to test the effect of a presumed multifaceted construct (see Hystad et al., 2010). This approach yields at least three limitations (Hull, Lehn, & Teddlie, 1991): (1) it assumes that the subcomponents are equally related to each other and to the overarching construct, (2) it leads to a loss of information and (3) it possibly masks differential components effects. However, the total score approach we used produces a more reliable and valid assessment of the independent variable and captures more adequately the complexity of hardiness. That said, our total score approach can result from limitations of the DRSII-M (Sinclair et al., 2003). In our study, this scale provided less than acceptable reliability coefficients for hardiness' subcomponents (commitment, control, challenge). At earlier stages of the project including this investigation, we aimed at identifying the most effective hardiness scale in the (Belgian and Dutch) military context. In a first study (Lo Bue, Taverniers, Mylle, & Euwema, 2013), we used Hystad et al. (2010) DRS 15 Revised, but with disappointing results regarding the internal consistency. In a second study (Lo Bue, Taverniers, Mylle, & Euwema, 2014), we used the older DRS 15 (Bartone, 2007). The reliability was quite good, but the subscales remained inconsistent. The present study was an attempt to test Sinclair et al. (2003) DRSII-M, specifically developed in the military context, previously translated in Dutch by Delahaij et al. (2010), and reliable in their study. For future research, we join Maddi's (2007) suggestion and recommend Maddi and Khoshaba's (2001) Personal Views Survey III-Revised.

To conclude, we based our findings on a longitudinal design that allows us to speculate about a possible causal relationship between hardiness and the performance outcomes, measured two months later. Also, our findings add to the scarce body of evidence relating hardiness to physical performance in the military context. Hardiness is related to performance during tasks that are both physically and psychologically demanding. Although hardiness' direct impact on behavioural persistence is rather limited, selecting hardy military candidates would improve their chances of success because they would be more likely to provide excellent physical performance during their basic training. Therefore, we join Bartone et al. (2013), Maddi et al. (2012) and Sandvik et al. (2013) to state that selecting for hardiness traits would be beneficial for the military organisation. Finally, past research indicates that hardiness is, to a certain extent, trainable (e.g. Judkins, Reid, & Furlow, 2006; Maddi et al., 2009; Maddi, Kahn, & Maddi, 1998). Endeavours to specifically develop the three facets of hardiness – commitment, control and challenge – among soldiers, as well as among athletes, may thus contribute to enhancing performance.

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